




Generating Evidence Through Meta-Analysis on Awareness among Parents Regarding Pit and Fissure Sealant as a Preventive Dental Treatment

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Abstract

Dental caries is a global burden for oral health. Pit and fissure sealants applied in childhood can help prevent caries; however, knowledge and awareness among parents regarding the prophylactic benefit of dental sealants are uncertain. This review was conducted with an aim to assess the awareness of parents toward pit and fissure sealants globally. A bibliographic search in the biomedical databases was conducted from inception till December 2022 with no restrictions on the language. The quality assessment of the studies was performed using the quality assessment checklist for analytical cross-sectional studies. The search found 12 eligible publications that were included in the review. Intraexaminer reliability Cohen's kappa ($\kappa = 0.96$) was assessed between two reviewers who independently screened, extracted data from included studies, and assessed risk of bias. Ten studies were found to have high risk while two had low risk of bias. The knowledge and awareness among parents regarding dental sealants ranged from 10.4 to 71%. The pooled data of 12 studies showed the overall knowledge of parents toward pit and fissure sealant to be 29%. Parents are found to be aware and supportive toward the usage of dental sealant as a caries preventive agent for their children. However, the level of awareness regarding pit and fissure sealant in this review varied from low to high which was not dependent on the parent's level of education, and overall awareness was found to be poor. Moreover, majority of the studies had high risk of bias. Future studies should strive for better methodological standards to avoid bias.

Keywords

- ▶ awareness
- ▶ parents
- ▶ pit and fissure sealants
- ▶ meta-analysis

Introduction

Dental caries is one of the most common oral ailments in children worldwide (~50%). Delayed treatment can affect not only basic daily routine like chewing, speech, and smiling but family's quality of life.¹ Treatment of dental diseases is very expensive across the globe and notably prevention is easy and effective.

The prevalence of dental caries in Indian population considering the mixed dentition was found to be 58% and among the children with primary dentition was found to be

54%.² This indicates a slow increase in caries prevalence during the transition between deciduous and mixed dentition. This is due to the time taken for caries to manifest as a clinically detectable lesion and the effects of dietary changes. The study assessing the geographic distribution of caries prevalence in India—the regional prevalence in western India was particularly high with 72%.²

The occlusal surfaces of posterior teeth are most prone to caries due to the deep and narrow anatomy of pits and fissures that can harbor plaque-derived bacteria that are

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inaccessible during brushing.³ Pit and fissure sealants act as a major preventive barrier against plaque and acids by forming a tough shield that prevents food and bacteria from entering these vulnerable areas on the occlusal surfaces of the teeth causing decay.⁴ It is well-known that sealants work better at preventing occlusal caries than topical fluoride. About 90% of caries in permanent posterior teeth and 44% of caries in primary teeth are caused due to deep pit-and-fissure.⁵ Moreover, it has been reported that using resin-based fissure sealants on first molars reduces caries from 86% in the first year to 78.6% in the second year and 58.6% in the fourth year.³ The pit and fissure sealant was developed to help manage these sites of stagnation that are generally resistant to various therapeutic approaches and, hence, contribute to a significant portion of the caries disease burden in the population. Although the public faces a significant difficulty in avoiding dental caries, raising parental awareness and implementing preventative measures, as carried out in industrialized nations, may result in a decline in dental caries and improved child health.⁶ The dental health care of a child is the responsibility of the parents.

Preschoolers often lack the manual dexterity and psychological maturity to brush themselves, as well as the ability to appreciate the significance of keeping good oral health. Most parents are extremely busy in their work schedules that they are unable to dedicate time toward the child's daily routine activities. The knowledge of parents definitely plays a great role in improving the oral health of the patients. Parental or caregivers' knowledge of nutrition, the impact of feeding practices, screen time, and peer pressure, all play a role in influencing the child's eating behavior and its impact on oral health. This review aims to systematically assess cross-sectional studies and summarize the evidence on the awareness of the parents toward pit and fissure sealants as an effective measure to prevent dental caries.

Methods

This systematic review and meta-analysis was registered in PROSPERO (International register for registering systematic reviews prospectively; CRD42022351020). This report follows the guidance of the Preferred Reporting Items for Systematic Reviews and Meta-Analyses statement.

Selection Criteria for the Studies in This Review

Type of studies

We included cross-sectional, observational studies and epidemiological studies. We excluded quasi-randomized trials, nonrandomized trials, and parallel and split-mouth randomized controlled trials.

Type of Participants and Outcome Measures

We included studies that involved parents of children from the general population who were assessed for their awareness toward pit and fissure sealants. We defined "population" as either parent or both and outcome as their awareness toward "pit and fissure sealant."

Search Methods for the Identification of Studies

We searched electronic databases like PubMed, Scopus, Web of Science, EBSCO, MEDLINE, and Google Scholar, from inception to December 2022. We used a combination of keywords and controlled vocabulary that we adapted for each electronic database (→ Table 1).

Data Collection and Analysis

Selection of Studies

In the first stage, two reviewers (K.S.D. and A.M.) independently screened the titles and abstracts of all retrieved references by using a standardized form. Because they used an inclusive criterion, when the reviewers disagreed on the eligibility status for a particular reference, they included the citation in question at this stage and resolved the disagreement at the full-text screening stage. In the second stage, two reviewers independently screened the full text of all potentially eligible studies. They resolved any disagreement by means of discussion. When consensus was elusive, a third reviewer (So.K), acting as an arbiter, decided final eligibility.

Data Extraction and Management

Using a standardized form, two reviewers (K.S.D. and A.M.) independently extracted data from all the included studies. The form included instructions to extract the main characteristics of the studies, including the type of study design, population

Table 1 Search strategy used in PubMed to search for the relevant articles

Search strategy used in PubMed	Number of articles selected
Parents AND children AND awareness AND dental caries	5
Parents AND children AND awareness AND dental caries AND prevention	1
Parents AND children AND awareness AND pit and fissure sealant	0
(father OR mother OR parents) AND (child OR siblings) AND (pit fissure sealants OR dental sealants) AND awareness	1
Parents AND (child OR siblings) AND (pit fissure sealants OR dental sealants) AND knowledge AND attitude AND practice	0
Parents AND children AND pit and fissure sealant AND knowledge	1
Total number of articles retrieved	8

(age, sex, and education of parents) and the outcome (knowledge of the parents with respect to), and the authors' conclusion. When these reviewers identified discrepancies that they were unable to clarify, a third reviewer (So.K) acted as arbiter.

Assessment of the Risk of Bias of Included Studies

Two reviewers (K.S.D. and A.M.) independently assessed the risk of bias for each included study by using the Joanna Briggs Institute (JBI) critical appraisal tool for analytical cross-sectional study. For each domain, we determined whether a study had high or low risk of bias. We resolved any disagreements by means of discussion until we reached consensus.

Results

The cross-sectional studies included in the review were from inception till August 2022, and 1,217 studies were

revealed from the search procedure. A total of 1,205 records were identified through database search in PubMed and Scopus. Google Scholar yielded 12 articles based on titles giving 1,217 articles overall. These articles were subjected to screening process based on titles, duplicates, abstracts, and full-text reading and were included and/or excluded according to eligibility criteria predefined. In the stepwise process, the articles were screened based on titles and duplicate removal to include the relevant manuscripts. The articles were screened finally for full text, the articles which were unable to provide the relevant information were excluded at this step. Thus, a total of seven manuscripts were excluded. The reason for exclusion was information being reported in mean, irrelevant data or the information was not reported. After selection according to inclusion and exclusion criteria, 12 studies were included in the quantitative pooling (meta-analysis; ►Fig. 1). On

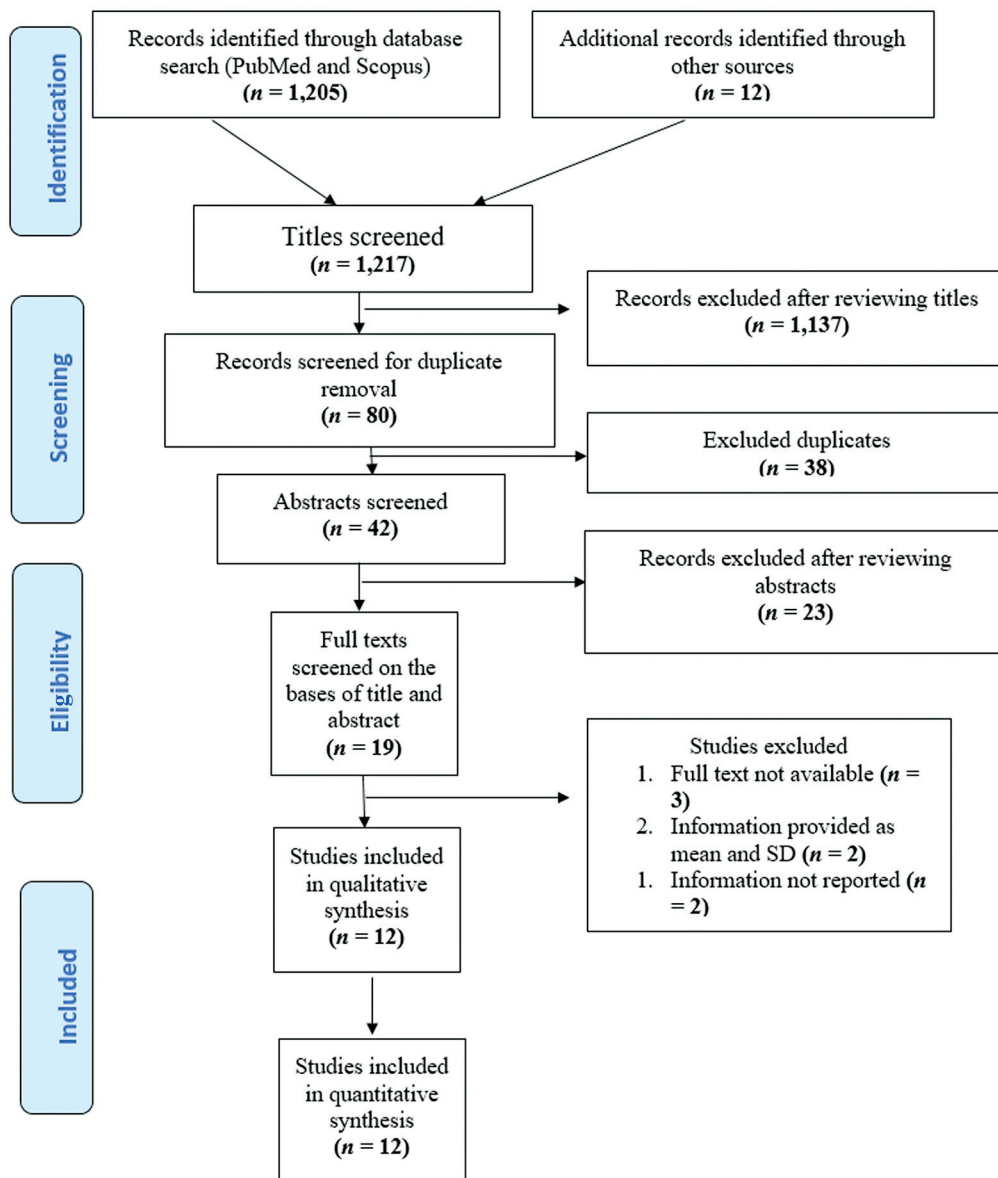


Fig. 1 PRISMA flow chart of the included studies. PRISMA, Preferred Reporting Items for Systematic Reviews and Meta-Analyses; SD, standard deviation.

Study	Risk of bias domains						Overall
	D1	D1b	D2	D3	D4	D5	
Mafeni J 1994	+	+	+	+	+	+	+
Nakhjavani YB et al 2012	+	+	+	X	X	+	X
Nair BG 2016	+	+	+	X	+	+	X
Gurunathan D et al 2018	+	+	+	+	X	+	X
Sabbagh H J et al 2019	+	+	+	+	+	+	+
Kaur S et al 2019	+	+	+	X	X	+	X
Junger ML et al 2019	+	+	X	X	+	+	X
Zakirulla M et al 2019	+	+	+	X	X	+	X
Lakshmanan L 2020	+	+	+	X	X	+	X
Deep A et al 2020	+	X	+	X	X	+	X
Almalki SA et al 2021	+	+	+	+	X	+	X
Almutairi MA 2021	+	+	X	X	X	+	X

Domains
D1 : Bias arising from the randomization process.
D1b: Bias arising from the timing of identification and recruitment of individual participants in relation to timing of randomization.
D2 : Bias due to deviations from intended intervention.
D3 : Bias due to missing outcome data.
D4 : Bias in measurement of the outcome.
D5 : Bias in selection of the reported result.

Judgement
X High
+ Low

Fig. 2 Risk of bias of the included studies.

critical appraisal of the included studies using the Joanna Briggs Institute critical appraisal tool for cross-sectional studies, it was found that two studies had a low risk of bias and nine studies had a high risk. Results of bias assessment are presented in traffic light plot (► Fig. 2).

The data obtained from 12 studies were compiled in a single spreadsheet reporting knowledge of parents toward pit and fissure sealant therapy. The characteristics of the studies were narratively discussed (► Table 2).

Quantitative Synthesis

Heterogeneity across the studies was assessed using I^2 test and it was found to be high (99.14%). Thus, a random effects model was used for meta-analysis using MedCalc Statistical Software version 20.218 (MedCalc Software Ltd., Ostend, Belgium) to obtain pooled data on knowledge of the parents toward pit and fissure sealants. Random effects model was used as it takes into consideration the heterogeneity across studies. The pooled data of 12 studies reporting knowledge of parents toward pit and fissure sealant therapy found to be 29% with confidence interval (lower bound (LB = 15.35%) and upper bound (UB = 49.9%) ► Fig. 3). There was no evidence of publication bias (► Fig. 4). On subgroup analysis of the studies conducted in India, the knowledge of parents toward pit and fissure sealant was found to be 21% (► Fig. 5).

Discussion

There are several studies being conducted globally to comprehend the knowledge and awareness of parents toward pit

and fissure sealants for prevention of dental caries among children. The purpose of this review was to assess the level of knowledge of parents toward the pit and fissure sealant therapy. In affluent nations, raising parental awareness of their children's oral health has decreased dental caries and in turn improved children's health.⁷ Children's dental health today and their future oral health as adults are both impacted by the healthy habits they develop as youngsters.⁸ Children's fissure sealants play an important role in the prevention of dental cavities. Dental fissure sealants should be applied to primary or permanent teeth when it is established that the tooth is at risk of developing dental caries in dental fissures and deep grooves, according to the American Dental Association and the American Academy of Pediatric Dentistry.⁹ Among the included studies, only four studies were conducted in varied regions of India.¹⁰⁻¹³ Of these, studies conducted by Kaur et al and Lakshmanan et al included same number of parents as their sample size ($n=250$).^{11,12} The study by Lakshmanan et al was conducted in a hospital-based setting, while the study by Kaur et al was conducted among parents of children coming to four different schools in Udham Singh Nagar area and, therefore, the results of the study could be generalized with respect to the population of that area. Highest sample size ($n=432$) was conducted among mothers of school children chosen randomly. A small sample size ($n=80$) was recruited in a study conducted by Deep et al¹³ and the authors did not provide any details wherefrom the sample was chosen. A cross-sectional survey conducted with small sample size will not help in generalizing the results to the population of interest.

Table 2 Characteristics of the included studies

Study Id	Author's name/ Year of publication	Place	Sample size	Age of children	Education of parents	Previous dental visit	Knowledge with respect to; n (%)	Authors' conclusion
1.	Mafeni J 1994 ¹⁹	Melbourne	487	18 years and below	Secondary and postsecondary	84%	Sealants are effective in preventing dental caries 226 (46.4%)	Parents not well informed of sealants, also area of origin and socioeconomic status had an impact on sealant placement
2.	Nakhiavani YB et al 2012 ²⁰	Iran	250	7-9 years	University degree: 49% High school: 45.2% Below high school: 5.8%	?	Sealant definition, application, age group related to application, and survival 56 (22.3%)	The knowledge among the mothers regarding sealants was low
3.	Nair BG 2016 ²¹	South Africa	295	Grade 1 children	Tertiary: 24.4% Secondary school: 50.2% Primary school: 22.3%	?	Awareness of fissure sealant 192 (65%)	There is a gap in knowledge, attitude, and practice of parents with respect to dental sealants
4	Gurunathan D et al 2018 ¹⁰	Tamil Nadu	432	pre-school children	School level: 35% Diploma/Degree: 65%	?	Pit and fissure sealants as a preventive measure of dental caries 2 (0.013%)	Graduate mothers had more knowledge about preventive measures
5.	Sabbagh HJ et al 2019 ¹⁴	Kingdom of Saudi Arabia	549	≤16 years	Illiterate: 7 Primary/Intermediate:31 High school: 81 University or higher: 164 Mothers are illiterate: 5 Primary/Intermediate:38 High school: 98 University or higher: 142	?	Aware of fissure sealants 96 (24.4%)	They found an association between socioeconomic status and the level of parental dental knowledge and practices
6.	Kaur S et al 2019 ¹¹	India	250	11-14 years	?	36.80%	Sealants prevent dental caries 26 (10.4%)	Knowledge was found to be insufficient among parents. The practice regarding fissure sealants was nil and the attitude was not up to the mark in spite of motivational program
7.	Junger ML et al 2019 ²²	United States	716	?	High school diploma or lower: 13.6% High school diploma: 21.6% High school diploma or higher: 64.8%	?	Sealants prevent dental caries 395 (55.1%)	Half of the parents had knowledge about the dental sealants
8.	Zakirulla M et al 2019 ¹⁵	Kingdom of Saudi Arabia	350	7-12 years	Academic: 22.9% Diploma: 48.9% High school: 22.0% Illiterate: 6.3%	100%	Fissure sealants are beneficial in prevention of dental caries in children 77 (22%)	Mothers' knowledge and acceptance of preventive dental procedures for children was low
9.	Lakshmanan L 2020 ¹²	India	250	?	Graduates: 80% High school: 15% Primary schooling: 5%	?	Sealants are effective in preventing dental caries 178 (71%)	Knowledge and attitude of parents was supportive for the sealant placement. Practice was found to be poor
10.	Deep A et al 2020 ¹³	India	80	7-12 years	Diploma: 26% Academic education: 37%	?	Fissure sealants as preventive measure for dental caries 18 (22%)	Knowledge among parents for fissure sealant was low while attitude was found to be positive
11.	Almaiki SA et al 2021 ¹⁶	Riyadh, Saudi Arabia	350	?	Not educated: 15 (5%) Up to secondary: 111 (37%) Bachelor: 154 (51.3%) Masters: 16 (5.3%) PhD: 4 (1.3%)	65.7%	Awareness about pit and fissure sealants 134 (58%)	Parents had knowledge about preventive dental treatment which was related to their level of education. The level of utilization was poor
12.	Almutairi MA 2021 ²³	Saudi Arabia	206	?	Below high school: 22 (10.7%) High school: 33 (16%) University degree: 151 (73.3%)	Less than a year: 105 (50.5%) Between 1 and 2 years: 44 (21.4%) More than 2 years: 58 (28.2%)	Covering deep normal fissures of tooth crown by tooth color material as a foundation 31 (15%)	Parents knowledge about pit and fissure sealant was found to be poor

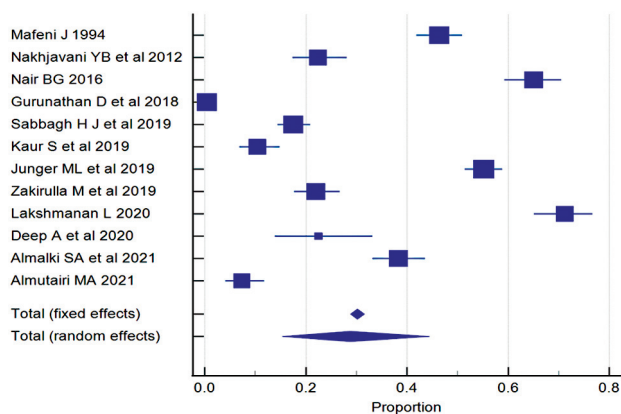


Fig. 3 Forest plot depicting awareness of parents toward pit and fissure sealants globally.

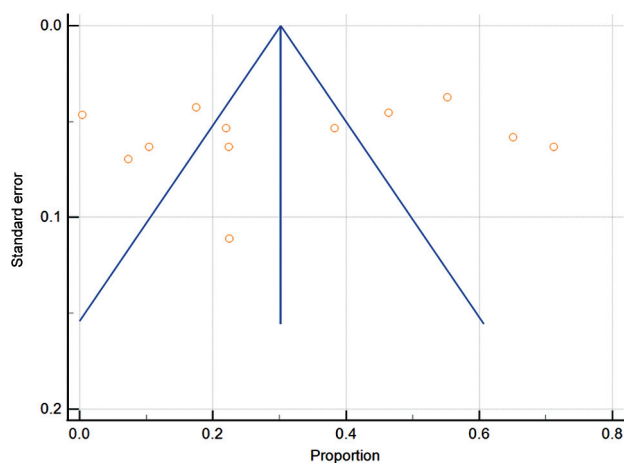


Fig. 4 Funnel plot depicting publication bias.

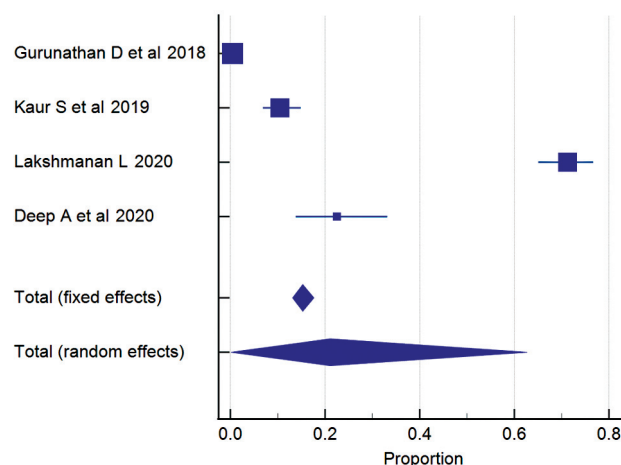


Fig. 5 Forest plot depicting awareness of parents toward pit and fissure sealants in India.

Studies conducted in the Kingdom of Saudi Arabia showed better level of education among the parents.¹⁴⁻¹⁶ Among these studies Almaki et al¹⁶ in their results showed that only 58% of parents were aware about pit and fissure sealant as a preventive material, while 74% of parents had a positive

attitude toward prevention of oral diseases. The results are similar to a study conducted in Ethiopia by Duguma and Zemed where 72.5% of participants had a positive view regarding prevention of childhood caries. The parents' level of knowledge will determine their attitude toward preventing the disease.^{16,17} Taking into consideration that the primary teeth are significant as they are considered the natural space maintainers for permanent teeth and preserving them is of utmost importance.¹⁸ If the parents are made aware of the various materials available for preventing dental caries, this would definitely improve the oral health-related quality of life.

Dental visit pattern of parents to the dental clinic has an impact on the level of knowledge. Parents who frequently visit their dentists are exposed to preventive knowledge that may have an impact on the dental health of their children. Thus, it is crucial to raise dentists' knowledge emphasizing the importance of teaching parents how to protect their children against dental problems. To assess if parents are aware of the issues surrounding the oral health of their children, more research is required. A study conducted by Mafeni et al reported that 84% of parents visited the dentist biannually, but only 46% of parents had the awareness that sealants are effective in preventing dental caries.¹⁹ One of the reasons could be that patients visited the dentist with some other concern rather than dental caries or they were not accompanied by children. Another reason could be that they did not have an interaction on caries prevention method. In a study by Zakirulla et al in Saudi Arabia all the mothers had visited the dentist earlier. In spite of sound education, only 22% of the mothers were aware that fissure sealants help in prevention of dental caries.¹⁵ This was contrary to another study conducted in Saudi Arabia among fathers where more than 50% of the recruited samples had a graduation degree, and 66% of the fathers had visited the dentist earlier. Fifty eight percent of the fathers in the study were aware that pit and fissure sealant is a preventive dentistry procedure. This signifies that self-awareness combined with routine visits to dentist will increase the knowledge and acceptability of parents toward fissure sealants.

A study conducted in Tamil Nadu, India, showed that 71% of parents had the knowledge that pit and fissure sealants help in preventing dental caries which was contrary to another study conducted in a district in Uttarakhand where only 10% of parents were aware of the fact that dental sealants prevent dental caries. This might be due to the literacy level of the population and accessibility of parents to dentists as Udham Singh Nagar is an area with hilly terrain.

Overall, the knowledge of parents on combining 12 studies was found to be 29%, which was on a lower side. Improving the knowledge and awareness of parents toward pit and fissure sealants will definitely improve their usage. Consequentially, this will help in improving the oral health status and oral health-related quality of life of the children.

Limitations

There were few limitations of this review; first, though the intention was to present global data yet there are a smaller

number of published studies portraying the burning issue. There were very few studies captured from the literature that would represent maximum countries. Second, limitation of the databases searched for the inclusion of articles might have led to missing out of important articles from other databases.

Conclusion

The awareness of parents toward pit and fissure sealant was limited globally, which could be concluded through meta-analysis. Majority of the studies included in the review had high risk of bias. Hence, studies of high standards will help to reach a better conclusion. Parents are seen to have little knowledge of professional preventive dental treatment, thus there is a need to increase public awareness which will help to enhance children's oral health. It appears that by increasing dentists' knowledge toward preventive strategies and by motivating them to uplift their usage by prescribing sealants during their regular services would impart a better knowledge to the parents. Involving the media in public education can also be effective strategy to increase society's utilization of the use of preventive measures for oral health. Parents should seek more primary dental care education from health care professionals and governmental agencies.

Ethical Approval

This review has obtained institutional research committee approval.

Conflict of Interest

None declared.

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